

TIME DOMAIN REFLECTOMETRY WITH NONLINEAR TRANSMISSION LINES

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ABSTRACT:

In the high-speed digital systems, time-domain reflectometry (TDR) and time-domain transmission (TDT) are currently the predominant measurement methods. In a sense, they are generalization of the step-response of low-frequency circuits. The measurement accuracy is directly related to the rise-time of the edges used as excitations in the process.

The standard strip-line with nonlinear active dielectric allows for varying the propagation constants using adjustable bias as well as the propagating signal itself. This effect is used to generate ultra-steep signal edges in the proposed project. The nonlinear dielectric is can be implemented as polarized p-n junction, where the signal propagates transversal to the DC bias component. The PCB-based prototype with discrete distributed p-n junctions (diodes) demonstrates capabilities of the proposed mechanism.

In the millimeter-wave range, the VLSI technology can provide means to implement integrated striplines and other microwave circuit components using nonlinear and active substrate. This will ultimately lead to inexpensive pico-second circuitry.